

**UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF CALIFORNIA  
SAN FRANCISCO DIVISION**

COREPHOTONICS, LTD.

Plaintiff,

vs.

APPLE INC.

Defendant.

Case No. 3:17-cv-06457-JD (Lead Case)  
Case No. 3:18-cv-02555-JD

**DECLARATION OF JOHN C. HART IN SUPPORT OF COREPHOTONICS'  
REPLY CLAIM CONSTRUCTION BRIEF**

I, John C. Hart, declare and state as follows:

1. I submit this declaration in connection with claim construction proceedings in the above-captioned matter. My prior declaration submitted with Corephotonics' Opening Claim Construction Brief included information about my background and qualifications

2. I have been asked to consider and provide opinions regarding certain issues relating disputed claim terms in this matter raised in Apple's Responsive Claim Construction Brief dated October 13, 2022.

3. I have reviewed Apple's October 13 Responsive Claim Construction Brief, as well as the exhibits and two expert declarations attached thereto, including specifically the Declaration of Fredo Durand and Declaration of John Tesar, Corephotonics' Preliminary Patent Owner Response and Patent Owner Response in IPR2020-00905 (Apple's Exhibits J and K, respectively), my expert declaration prepared in support of Corephotonics' Patent Owner Response in IPR2020-00905 (Apple's Exhibit L), and the brief transcript excerpts of the deposition I gave in IPR2020-00905 (Apple's Exhibit M).

4. In addition to the materials above, I have also reviewed the following: Apple's Petition for Inter Partes Review in IPR2020-00905, and the complete transcript of the deposition I gave in IPR2020-00905. Finally, I have reviewed the Final Written Decision issued in IPR2020-00905. I understand these items will be filed with Corephotonics' Reply Claim Construction Brief.

5. I provided opinions on behalf of Corephotonics in IPR2020-00905. I am generally familiar with the record in that proceeding as well as the issues disputed there between Corephotonics and Apple.

6. My responses to various points raised in Apple's Responsive Claim Construction Brief and Dr. Durand's declaration are presented herein.

**“Tele”/“Wide”**

7. Dr. Durand at ¶¶ 62-68 of his declaration appears to attempt to limit the ’291 specification based on the Border reference it cites. Dr. Durand’s conclusions about that do not reflect how a person of ordinary skill in the art (“POSITA”) would have understood the Border reference and its discussion in the ’291 patent. Even if Border disclosed a wide-angle camera meeting Apple’s proposed construction for “Wide” and a telephoto camera meeting Apple’s proposed construction for “Tele,” these would still have served as examples of a “Wide” sensor and a “Tele” sensor for the ’291 specification because “[Border’s ‘Wide’ or] ‘W’-image reflects a wider FOV and has lower resolution than [Border’s ‘Tele’ or] ‘T’-image... .” In other words, a POSITA would have understood Border’s Wide and Tele sensors to have been examples of ’291 Wide and Tele sensors because Border’s Wide sensor had a wider field of view than Border’s Tele sensor, and the ’291 clearly states at 2:13-14 that the difference between a Wide image and a Tele image is the relative FOV (and the subsequent differences in resolution of the captured features of the scene). A POSITA would not have understood the references to Border in the ’291 patent to limit the terms “Wide” and “Tele” in the ’291 patent to be limited to the examples in Border as Dr. Durand suggests.

8. Dr. Durand then at ¶76 opines that a POSITA would have understood “telephoto” according to its standard technical meaning in the relevant field, referring to the lens design characteristic where the total track length (TTL) is smaller than effective focal length (EFL).” Dr. Durand at ¶ 81 further opines “the understanding that a POSITA would have had of the meaning of the term ‘telephoto’ in the relevant context of the ‘291 Patent.” But the ’291 Patent never uses the term “telephoto.”

9. Dr. Durand at ¶ 89 opines that “A POSITA would not have understood ‘wide angle’ and ‘telephoto’ (or ‘Wide’ and ‘Tele’ in the ‘291 Patent claims) to merely refer to any arbitrary two lenses with relatively longer or shorter focal lengths, or relatively wider or narrower fields of view, as Corephotonics and the Hart declaration assert.” I disagree. Regardless of “wide angle” or “telephoto,” a POSITA would indeed have understood “Wide” and “Tele” in the ’291 Patent claims to refer to any arbitrary two lenses with relatively longer or shorter focal lengths, or relatively wider or narrower fields of view, as the ’291 at 2:13-14 makes this explicitly clear that this is the sole element that differentiates “Wide” from “Tele” in its disclosure.

10. Dr. Durand further opines at ¶ 89 that “if a first lens has a relatively shorter focal length of 25 mm and a second lens has a relatively longer focal length of 30 mm, that does not mean the first lens is ‘wide angle’ but the second lens is ‘telephoto.’” This opinion misses the point. If a first imaging section used Dr. Durand’s proposed first lens, and a second imaging section used Dr. Durand’s proposed second lens, then a POSITA would nevertheless have understood the first imaging sections to be “Wide” and the second imaging section to be “Tele” because the “Wide” imaging section would have had a wider field of view than the “Tele” imaging section.

11. The ’291 patent specification and claims clearly define the “Wide” and “Tele” imaging sections as using lenses with relatively wider (Wide) and relatively narrower (Tele) fields of view in relation to one another. Dr. Durand’s opinions appear to be grounded in an assumption that the terms (defined within the claims) should instead be read as the different terms – “wide angle” and “telephoto.” The patent specification and claims do not impose this change and Dr. Durand does not point to anything requiring such a change. Most of his arguments simply assume this incorrect replacement and then discusses his views of what constitutes a “wide-angle” or “telephoto” lens – terms that are not actually in the patent claims.

12. I also disagree with Dr. Durand's discussions of "normal" fields of view and how that concept might apply to the claims of the '291 patent. Dr. Durand suggests that a "normal" field of view is a lens with an effective focal length equivalent to approximately 50-55 mm. I do not agree that a POSITA would have this understanding in the context of the miniature multi-camera systems for mobile devices like cell phones to which the '291 patent is directed. Dr. Durand discusses what might be considered a "normal" field of view for a conventional 35mm single lens reflex (SLR) camera. It is not clear how this could be considered "normal" for a compact mobile phone camera. Dr. Durand does not point to any basis for suggesting that his discussion of "normal" fields of view are in any way applicable to such compact camera systems. For example, Dr. Durand does not show what field of view earlier single camera compact cell phone cameras used (i.e. phones that had only a single imaging section). Dr. Durand does not (and cannot) show that such cameras were "normalized" around his 50-55 mm equivalent "normal" field of view. This further shows that Dr. Durand's proposed definitions based on a "normal" field of view are unclear to a POSITA and unworkable.

### **Fusion**

13. Dr. Durand opines at ¶96 that Border discloses a "stitching" method that "uses the pixels from the wide image 204 in the outer portion of the composite image 208 and using all of the pixels from the telephoto image 206 in the center portion of the composite image 208." Then Dr. Durand opines that "[t]he '291 Patent reiterates this process, merely replacing the words 'stitch' and 'composite' with the term 'fused.'" But the '291 specifically uses the term "stitched" in its description of Border, but not in its description of its own invention. The '291 specification refers to Borders method as "stitched (fused) together to form a composite ('fused') image," ('291 at 2:14-16) because both the '291 inventors and a POSITA understood stitching and compositing

to be examples of fusion, but that fusion included other methods besides stitching and compositing. This passage from the '291 specification reveals that the inventors were fully aware of “stitching” but did not want to restrict their invention to only stitching and wanted to include broader methods that a POSITA would have understood from their term “fusion.” Therefore, I disagree with Dr. Durand’s opinion that “a POSITA would understand the verb ‘fused’ to refer to combining the pixels from the Wide and Tele images to form a composite image, and the adjective ‘fused’ to refer to a composite formed by using the pixels from the Wide and Tele images.”

14. Apple’s proposed construction for “fused” is “formed into a composite that includes pixels from the Wide and Tele images,” but Dr. Durand at ¶107 opines that Apple’s proposed construction “does not require that the exact Wide and Tele image pixels are present in the composite image.” Dr. Durand attempts, unsuccessfully, to clarify this opinion with tautologies. “Rather, it only requires that they are included. In other words, the resampled Tele image pixels that are fused in Figure 5, step 512 include Tele image pixels, and thus Tele image pixels are included in the output. In other words, the Wide and Tele image pixel values are combined to create the pixels of the output image.” Dr. Durand’s opinions clarifying Apple’s proposed construction of “fused” reduce the term to a calculation involving one or more pixel values from the two input images. Dr. Durand does not require the composite image to contain any “exact Wide and Tele image pixels” and so the fused image is not required to include any pixel that is simply reproduced unchanged in value from either a Wide image pixel or a Tele image pixel. Hence, Dr. Durand appears to agree with Corephotonics proposed construction for “fused” as “output image including a combination of image information from two images.”

15. Contrary to the characterization found in Apple’s Responsive Claim Construction brief, I did not opine in IPR2020-00905 that “fusion” required the combination of pixels or the

production of an output image that “includes pixels” from input images. The testimony quoted by Apple from my deposition in IPR2020-00905 concerned answers regarding Figure 5 of the ’479 patent. I addressed the identical Figure 5 embodiment (of the ’291 patent) in my declaration in support of Corephotonics’ Opening Claim Construction Brief. The Figure 5 embodiment involves, among other things, an image fusion process that combines Wide image pixels with resampled data from Tele image. This is of course, consistent with what I said in the IPR2020-00905 deposition: *“Yes. It will use pixel values in the determination of the – it will – it will – it will look at the pixel values from both images in determining the pixel values of the output image.”* This obviously does not mean that I said, or even implied, that “fusion” is *limited* to a process that creates an output image which always “includes pixels” of all input images.

16. Moreover, I note that IPR2020-00905 concerned a challenge to independent claims 1 and 23 of the ’479 patent, both of which required pixel-based fusion. Claims 1 and 23 of the ’479 patent are as follows:

*1. A dual-aperture digital camera for imaging an object or scene, comprising:*

*a) a Wide camera comprising a Wide lens and a Wide image sensor, the Wide camera having a respective field of view FOVW and being operative to provide a Wide image of the object or scene;*

*b) a Tele camera comprising a Tele lens and a Tele image sensor, the Tele camera having a respective field of view FOVT narrower than FOVW and being operative to provide a Tele image of the object or scene, wherein the Tele lens has a respective effective focal length EFLT and total track length TTLT fulfilling the condition  $EFLT/TTLT > 1$ ;*

*c) a first autofocus (AF) mechanism coupled mechanically to, and used to perform an AF action on the Wide lens;*

*d) a second AF mechanism coupled mechanically to, and used to perform an AF action on the Tele lens; and*

*e) a camera controller operatively coupled to the first and second AF mechanisms and to the Wide and Tele image sensors and configured to control the AF*

*mechanisms and to process the Wide and Tele images to create a fused image, wherein areas in the Tele image that are not focused are not combined with the Wide image to create the fused image and wherein the camera controller is further operative to output the fused image with a point of view (POV) of the Wide camera by mapping Tele image pixels to matching pixels within the Wide image.*

23. *A method comprising:*

- a) providing a dual-camera comprising a Wide camera and a Tele camera, the Wide and Tele cameras having respective Wide and Tele lenses, Wide and Tele image sensors and Wide and Tele fields of view  $FOV_W$  and  $FOV_T$ , wherein  $FOV_T$  is narrower than  $FOV_W$ , wherein the Tele lens has a respective effective focal length  $EFL_T$  and total track length  $TTL_T$  fulfilling the condition  $EFL_T/TTL_T > 1$ ;*
- b) acquiring a Wide image with the Wide sensor and a Tele image with the Tele sensor;*
- c) processing the Wide and Tele images to create a fused image, wherein areas in the Tele image that are not focused are not combined with the Wide image to create the fused image; and*
- d) outputting the fused image with a point of view (POV) of the Wide camera by mapping Tele image pixels to matching pixels within the Wide image*

17. As the claims 1 and 23 of the '479 patent show, all challenged claims in IPR2020-00905 required combining ***pixels*** from Wide image with ***pixels*** of Tele image. This is why, unsurprisingly, Apple, with Dr. Durand's testimony, contended that prior art reference Parulski taught ***pixel-based fusion*** involving the replacing of one ***area*** of an image with an ***area*** of another. For example: Apple's Petition at page 28 in IPR2020-00905 argued the following about Parulski's teachings:

Based on Fig. 14 and the example that Parulski provides of having an image of mountains captured at one extreme focus distance (i.e., the wide image focused on the mountains) and the image of a dog captured at the other extreme focus distance (i.e., the telephoto image focused on the dog), ***a POSITA would have understood that creating an enhanced image with both the mountains and the dog in focus would have meant that the pixel corresponding to the dog from the telephoto image would have been identified by the range mapping process and then fused with the corresponding pixels in the wide image so that the dog would be***

***sharpened in the wide image while maintaining the mountains in focus***, thus broadening the wide image's depth of field

18. I further note that the Board in IPR2020-00905 also noted that Apple had argued that Parulski disclosed a pixel-based fusion technique as allegedly invalidating the '479 patent's claims. Page 20 of that Final Written Decision states, among other things:

Petition further argues Parulski's image fusing process maps Tele image pixels with matching pixels within the Wide image, as required by claims 1 and 23 ... ***Petitioner argues that identifying and extracting pixels corresponding to the dog from the Tele image and fusing them with pixels corresponding to the dog*** from the Wide image would generate a fused image having the point of view (POV) of the Wide image because the resulting image would have the field of view (FOV) of the Wide image.

19. In other words, all parties agreed in IPR2020-00905 that the challenged claims required pixel-based fusion. It is why Apple argued that Parulski disclosed pixel-based fusion. It is why I opined in IPR2020-00905, in response to Apple and Dr. Durand's arguments there, that Parulski did not. As far as I know, neither Dr. Durand nor I, or Corephotonics or Apple, in IPR2020-00905, disputed whether "fusion," as a matter of claim construction, required producing an output image that "includes pixels" from input images. Certainly, I did not ***opine*** or "admit" that "fusion" was so limited in the context of the '479 patent.

### **"Image Data"**

20. Dr. Durand at ¶165-166 opines that "mechanical settings, white balance gain, exposure time, analog gain, and color correction matrix ... are 'secondary information,' not image data. Dr. Durand at ¶167 opines that if secondary information is image data, then "the use of the Wide camera secondary information together with a Tele image at a high ZF (as described in the passage above) would constitute fusion." This opinion is flawed in that it assumes that secondary information cannot be image data because **anything** that uses image data **must** be fusion. Just because video mode continuous zoom is achieved without fusion does not mean that the data used

by video mode continuous zoom isn't also image data. In fact, video mode continuous zoom must use image data because it is using pixels (primary information) along with the secondary information it highlights.

I declare under penalty of perjury that the foregoing is true and correct.

Executed October 21, 2022, in Champaign, Illinois

By:   
John C. Hart